Before the

FEDERAL COMMUNICATIONS COMMISSION
Washington, DC. 20554

In the Matter of		
Amendment of Parts 2 and 97 of the Commission's Rules to Create a Low Frequency Allocation for the Amateur Radio Service	)	**ET Docket No. 02-98 RM-9404**
Amendment of Parts 2 and 97 of the Commission's Rules Regarding an Allocation of a Band Near 5 MHz for the Amateur Radio Service	)	**RM-10209**
Amendment of Parts 2 and 97 of the Commission's Rules Concerning the Use of the 2400 -2402 MHz Band by the Amateur and Amateur-Satellite Services	)	**RM-9949**

To: The Commission

Comments of the Amateur Radio Research and Development Corporation (AMRAD).

AMRAD is a non-profit scientific and educational corporation dedicated to the development and furtherance of electronic and communication technologies. Our members are licensed amateur radio operators. AMRAD has been involved in LF experimentation for the past several years.

Enhancement for the 135.7 – 137.8 kHz Allocation (RM-9404)

AMRAD strongly supports the proposed secondary allocation of 135.7 –137.8 kHz to the amateur radio service. This allocation will provide the amateur radio community an

opportunity to learn about the propagation and technology of a portion of the frequency spectrum previously unavailable to the amateur radio community. Design of Low Frequency (LF) transmission systems, in particular efficient antenna systems, is a skill held by few individuals today. Amateur radio operators have applied computer antenna modeling, digital signal processing (DSP), and innovative digital modulation waveforms to the special case of transmission in the LF band. By providing amateur radio operators the opportunity to utilize this band, individuals will increase their knowledge and skills to design and operate equipment in the LF band.

A basic purpose of the Amateur Radio Service as defined in § 97.1 of the FCC Rules is the "expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronic experts." The pool of expertise in LF technology is declining within the U.S. industrial base and within government laboratories, primarily because people with LF expertise now retire without being replaced. This is a consequence of the fact that the currently installed U. S. military LF base systems, while critical to national security, are functioning satisfactorily and that new designs in the near term would not significantly improve on the installed base. AMRAD and others have observed, however, that LF expertise is indeed highly specialized and is becoming unavailable within the general communications engineering community. What is needed is to maintain a pool of this highly specialized expertise as these systems age and require a new generation of designs. With this proposed radio amateur LF allocation, the highly specialized skills necessary for the design of LF antennas and transmission systems will be retained and improved. The skills developed within the radio amateur community will

maintain the pool of knowledge and expertise needed to support the contribution of LF to national security. This pool will be increased by the FCC allocation of this new radio amateur frequency band. Radio amateurs will invest their own time and money to develop their own skills, equipment, computer software and expertise with enthusiasm, enjoyment and pride.

Overseas Experience

Amateur operation was authorized for LF on 136 kHz on January 30, 1998 for the United Kingdom. Other CEPT countries soon followed. These allocations resulted in the development of LF equipment and transmission systems by radio amateurs. As a result, communication was established between Canada and the U.K. on 10 September 2000, using one-watt Effective Radiated Power (ERP).

AMRAD Experience

On February 04, 1999, twelve members of AMRAD were granted an experimental Part 5 license, WA2XTF, to operate on 137.75 kHz with a power level of one-watt ERP. This license enabled these individuals to construct transmitting and receiving equipment and antennas, to study LF propagation, and to research modulation and weak-signal reception methods applicable to this frequency band. Other amateurs and experimenters were also inspired by this license action and developed receiving equipment and studied the propagation results from the transmissions authorized by this license. Another direct result of this experimental license was the development and publishing by U. S. amateurs of an E-field receive antenna design and an innovative low-noise LF converter design.

The unique propagation modes and noise characteristics of LF have encouraged the investigation of alternative modulation waveforms using DSP techniques based on inexpensive computer sound cards. In addition, an Internet LF interest group exchanging ideas and methods was established that continues to this day between US amateurs and amateurs in other countries that have the LF allocation.

The LF band presents many unresolved technology challenges due to noise and the low inherent efficiency of transmit antenna designs in limited space. AMRAD experience coupled with experience by the overseas radio amateurs suggests that the proposed transmitter power level limit of 200 watts is inappropriate and will restrict U. S. radio amateurs from achieving desired communications. Current data suggests that an EIRP of 2 watts represents a better power limit. Our experience and analysis leads us to conclude that EIRP can be reliably measured by radio amateurs. Our experience and collaboration with overseas radio amateurs demonstrates that typical transmitting antennas of practical dimensions have a measured efficiency of 0.1 % or less. Based on this experience, AMRAD recommends that the power limitation be defined only as 2 watts EIRP.

With regard to the interference to Power Line Carrier (PLC) Communication, the National Telecommunications and Information Administration studied the problem of interference of LF transmission to Power Line Carrier (PLC) circuits in 1985 and produced NTIA report 85-181. This detailed study examined potential interference from the Ground Wave Emergency Network (GWEN) to PLC transmissions, both operating in the same frequency range of 150-190 kHz. The report identified no regulatory problems

relative to PLC where transmissions from GWEN were of considerably higher power than is being considered for amateur use.

The opportunity for experimentation provided by the Commission in granting members of AMRAD the Part 5 experimental LF license has provided the opportunity to demonstrate that amateur radio operators do gain knowledge and skills in this important area of communications. By creating a Low Frequency allocation the Commission will expand this opportunity to the much larger radio amateur community. This will support one of the basic purposes of the Amateur Radio Service as defined in § 97.1 of the FCC Rules, to enhance the value of the amateur radio service to their community and nation. Accordingly, AMRAD supports the proposed action of RM-9404.

5240-5400 kHz band (RM-10209)

Addition of the 5240-5400 kHz band to the amateur service will provide an additional band to support communications when the existing amateur allocations in 3500-4000 kHz and 7000-7300 kHz cannot be used due to propagation conditions. The band will offer additional opportunity for amateurs to explore digital communications methods and will foster improved knowledge of propagation. AMRAD urges the Commission to make this new frequency band available to General, Advanced, and Extra Class licensees.

2400-2402 MHz Band (RM-9949)

AMRAD strongly supports the primary allocation of the 2400-2402 MHz band to amateur service. AMRAD has been very active in the development of amateur space

communications and developed OSCAR-27 to encourage amateur experimentation. The elevation of this band to primary status will encourage further investment and development of amateur satellite assets by eliminating concern that the spectrum may be re-allocated.

Respectfully Submitted,

George E. Lemaster, vice-president AMRAD
PO Drawer 6148
McLean, VA. 22106-6148